

PATENT

Serial No. 09/817,971

Amendment in Reply to Final Office Action mailed on December 14, 2005

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of processing data received ~~(500)~~ in a transport stream format to produce a modified transport stream ~~(522)~~ for recording on a recording medium ~~(3)~~ to record the wanted content of a selected audio-visual program ~~(hereinafter referred to as the wanted content)~~, the received transport stream comprising a multiplex of elementary streams conveying not only the wanted content but also the unwanted content of other programs not to be recorded ~~(the unwanted content)~~, said elementary streams of data having been encoded, divided into elementary stream (ES) packets with packet headers, the ES packets further sub-divided into a plurality of smaller transport packets, and the transport packets of a first and second elementary streams interleaved in the received transport stream with each other and with transport packets carrying data from neither stream, wherein the said modified transport stream is produced by:

identifying and selecting ~~(504)~~ received transport packets which correspond to the wanted content;

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recording ~~(514,520)~~ the selected transport packets within a recording medium ~~(3)~~ to form said modified transport stream, so as to preserve compliance with a transport stream target decoder model substantially without repacketizing or remultiplexing the streams; and

recording ~~(516,518,520)~~ auxiliary information on the same recording medium ~~(3)~~ for use by a reproducing apparatus in gaining access to the content of the modified transport stream via any of a set of potential entry points throughout the wanted content.

2. (Currently Amended) A-The method as claimed in claim 1 wherein said auxiliary information includes information ~~(CPI)~~ stored in a file separately from a file holding the modified transport stream.

3. (Currently Amended) A-The method as claimed in claim 2 wherein said auxiliary information ~~(CPI)~~ comprises an index listing characteristic points within at least one of the wanted elementary streams, and is obtained by parsing the elementary stream to identify individual access units offering a valid entry point for decoding said at least one elementary stream.

4. (Currently Amended) A-The method as claimed in claim 3 wherein said characteristic points are defined with a frequency

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substantially greater than one per second on the presentation time scale.

5. (Currently Amended) ~~A-The~~ method as claimed in claim 3 wherein said characteristic points are defined with reference to a video elementary stream, each referring to an intra-coded picture data.

6. (Currently Amended) ~~A-The~~ method as claimed in claim 1 wherein at least part of said auxiliary information is recorded within the modified transport stream.

7. (Currently Amended) ~~A-The~~ method as claimed in claim 1 wherein the received transport stream occasionally includes stream mapping information ~~(PSI)~~ identifying a transport packet ID code associated with each elementary stream, said stream mapping information being used to identify the wanted content and being subject to change throughout the received transport stream, and wherein at least part of said auxiliary information is created by parsing the received transport stream to extract the mapping information, and recorded so that current mapping information is accessible at each potential entry point without parsing the modified transport stream prior to the entry point.

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8. (Currently Amended) A-The method as claimed in claim 6 wherein at least part of said auxiliary information comprises additional transport packets inserted at each potential entry point in the modified transport stream.

9. (Currently Amended) A-The method as claimed in claim 6, wherein at least part of said auxiliary information overwrites header information received within the transport packets, in order to define the modified transport stream.

10. (Currently Amended) A-The method as claimed in claim 9 wherein the received transport stream occasionally includes stream mapping information identifying a transport packet ID code associated with each elementary stream, said stream mapping information being used to identify the wanted content and being subject to change throughout the received transport stream, wherein said auxiliary information overwrites packet ID codes in the transport packets so as to re-map the wanted content to a uniform set of ID codes throughout the modified transport stream.

11. (Currently Amended) A method as claimed in claim 1, including the ~~steps-acts~~ of :

identifying in the received data an elementary stream conveying auxiliary data useful in playback of the program to be

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recorded; and

in the case where the elementary stream conveying the auxiliary data is one conveying part of the unwanted content, generating a new elementary stream conveying the auxiliary data without the unwanted content.

12. (Currently Amended) ~~A-The~~ method according to claim 11 wherein the auxiliary data comprises clock reference data for synchronizing playback of the elementary streams.

13. (Currently Amended) ~~A-The~~ method as claimed in claim 1, wherein said elementary streams comprise at least video and audio of an audio-visual program to be ~~recorded~~ recorded.

14. (Currently Amended) ~~A-The~~ method as claimed in claim 1, wherein said received transport stream is compliant with the MPEG transport stream specification.

15. (Currently Amended) ~~A-The~~ method as claimed in claim 1, further comprising:

[[-]] reproducing stored program segments ~~(522, 524)~~ with a timing different to that of the received transport stream, in accordance with user command, by reading the recorded auxiliary information and using it to enter and commence reproduction by

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reading said modified transport stream from a desired entry point.

16. (Currently Amended) ~~A~~ The method as claimed in claim 15 wherein said reproducing is performed to effect a trick play mode of a frame-based elementary stream, using the auxiliary information to step through the program while presenting a subset of frames to a user, by reading said modified transport stream at a succession of entry points.

17. (Currently Amended) ~~A~~ The method as claimed in claim 15 wherein said auxiliary information is read and used implicitly as part of a standard decoding of the modified transport stream.

18. (Currently Amended) ~~A~~ The method as claimed in claim 15 wherein said auxiliary information is read and used to modify further the transport stream as reproduced from the recording medium ~~(3)~~, prior to standard decoding of the further modified transport stream.

19. (Currently Amended) A computer readable recording medium ~~(3)~~ wherein comprising a modified transport stream configured to record wanted content of a selected audio-visual program, the modified transport stream comprising a multiplex of elementary streams conveying not only the wanted content but also unwanted

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content of other programs not to be recorded, said elementary streams of data having been encoded, divided into elementary stream (ES) packets with packet headers, the ES packets further sub-divided into a plurality of smaller transport packets, and the transport packets of first and second elementary streams interleaved in the received transport stream with each other and with transport packets carrying data from neither stream, wherein the said modified transport stream comprises:

identified and selected transport packets which correspond to the wanted content configured to preserve compliance with a transport stream target decoder model substantially without repacketizing or remultiplexing the streams; and

auxiliary information for use by a reproducing apparatus in gaining access to the content of the modified transport stream via any of a set of potential entry points throughout the wanted content~~has been recorded by a method as claimed in claim 1.~~

20. (Currently Amended) ~~A signal conveying a~~embedded in a modified transport stream to or from a recording medium, wherein the modified transport stream has been modified by a method as~~elaimed in claim 1~~configured to record wanted content of a selected audio-visual program, the modified transport stream comprising a multiplex of elementary streams conveying not only the wanted content but also unwanted content of other programs not to be

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recorded, said elementary streams of data having been encoded, divided into elementary stream (ES) packets with packet headers, the ES packets further sub-divided into a plurality of smaller transport packets, and the transport packets of first and second elementary streams interleaved in the received transport stream with each other and with transport packets carrying data from neither stream, wherein the said modified transport stream comprises:

identified and selected transport packets which correspond to the wanted content configured to preserve compliance with a transport stream target decoder model substantially without repacketizing or remultiplexing the streams; and

auxiliary information for use by a reproducing apparatus in gaining access to the content of the modified transport stream via any of a set of potential entry points throughout the wanted content.

21. (Currently Amended) A ~~The~~ signal as claimed in claim 20 wherein said modified transport stream has been reproduced from said recording medium by a method as claimed in claim 15.

22. (Currently Amended) An apparatus ~~(6,8)~~ for recording a multiplex of elementary stream data received in a transport format the apparatus comprising means specifically adapted to generate and

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record a modified transport stream by a method as claimed in claim 1.

23. (Currently Amended) ~~An~~ The apparatus as claimed in claim 22 further comprising means for reproducing said modified transport stream by a method as claimed in claim 15.

24. (Currently Amended) A method of processing a received data stream ~~(500)~~ to produce a modified stream ~~(522)~~ for recording on a recording medium ~~(3)~~ to record the wanted content of a selected audio-visual program ~~(hereinafter referred to as the wanted content)~~, the received data stream comprising a multiplex of elementary streams conveying not only the wanted content but also the unwanted content of other programs not to be recorded ~~(the unwanted content)~~, the method comprising:

[[-]] identifying and extracting ~~(504)~~ from the received data stream the elementary data stream(s) conveying the wanted content;

[[-]] identifying ~~(504)~~ in the received data an elementary stream conveying auxiliary data useful in playback of the program to be recorded;

[[-]] in the case where the elementary stream conveying the auxiliary data is one conveying part of the unwanted content, generating a new elementary stream conveying the auxiliary data without that part of the unwanted content; and

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[[-]] multiplexing ~~(514)~~ together the elementary stream(s) extracted from the received stream with the new elementary stream to form said modified data stream for recording.

25. (Currently Amended) A The method according to claim 24 wherein the auxiliary data comprises a clock reference data for synchronizing playback of the audio-visual program.

26. (Currently Amended) A The method according to claim 24 wherein the received data stream is an MPEG-compliant Transport Stream as defined in ISO/IEC 13818-1 and the auxiliary data comprises the Program Clock Reference ~~(PCR)~~ as defined therein.

27. (Currently Amended) A method of processing data received ~~(500)~~ in a transport stream format to produce a modified transport stream ~~(522)~~ for recording on a recording medium ~~(3)~~ to record the wanted content of a selected audio-visual program ~~(hereinafter referred to as the wanted content)~~, said elementary streams of data having been encoded, divided into elementary stream ~~(ES)~~ packets with packet headers, the ES packets further sub-divided into a plurality of smaller transport packets, and the transport packets of the first and second elementary streams interleaved in the received transport stream with each other and with transport packets carrying data from neither stream, and wherein the received

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transport stream occasionally includes stream mapping information identifying a transport packet ID code associated with each elementary stream, said stream mapping information ~~(PSI)~~ being subject to change throughout the received transport stream, wherein the said modified transport stream is produced by:

[[-]] identifying ~~(504)~~ received transport packets which correspond to the wanted content using said stream mapping information;

[[-]] modifying packet ID codes in the transport packets so as to re-map the wanted content to a uniform set of ID codes according to their content type of the transport packets;

[[-]] recording the selected transport packets within a recording medium to form said modified transport stream, thereby to preserve compliance with a transport stream target decoder model and provide a greater number of potential entry points than in the received stream.

28. (Currently Amended) A method of processing data received ~~(500)~~ in a transport stream format to produce a modified transport stream ~~(522)~~ for recording on a recording medium ~~(3)~~ to record the content of a selected audio-visual program (hereinafter referred to as the wanted content), said elementary streams of data having been encoded, divided into elementary stream ~~(ES)~~ packets with packet headers, the ES packets further sub-divided into a plurality

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of smaller transport packets, and the transport packets of the first and second elementary streams interleaved in the received transport stream with each other and with transport packets carrying data from neither stream, and wherein the received transport stream occasionally includes stream mapping information identifying a transport packet ID code associated with each elementary stream, said stream mapping information being subject to change throughout the received transport stream, wherein the said modified transport stream is produced by:

[[-]] identifying received transport packets which correspond to the wanted content using said stream mapping information;

[[-]] parsing ~~(504)~~ the receive transport packets to obtain said mapping information for potential entry points throughout at least on of the elementary streams;

[[-]] recording ~~(520)~~ the selected transport packets together with said auxiliary information within a recording medium to form said modified transport stream, thereby to preserve compliance with a transport stream target decoder model and while providing a greater number of potential entry points than in the received stream.

29. (Currently Amended) A ~~The~~ method as claimed in claim 27 wherein at least part of said auxiliary information comprises

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additional transport packets inserted to reproduce current mapping information at each potential entry point in the modified transport stream.

30. (Canceled)

31. (Canceled)

32. (Currently Amended) An apparatus ~~(6,8)~~ for recording a multiplex of elementary stream data received in a transport format the apparatus comprising means specifically adapted to generate and record a modified transport stream by a method as claimed in claim 24.

33. (Currently Amended) An apparatus as claimed in claim 32 further comprising means for reproducing said modified transport stream by a method as claimed in ~~any of~~ claim 15.

34. (Canceled)

35. (Canceled)

36. (Currently Amended) An apparatus ~~(6,8)~~ for recording a multiplex of elementary stream data received in a transport format

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the apparatus comprising means specifically adapted to generate and record a modified transport stream by a method as claimed in claim 27.

37. (Canceled)

38. (Canceled)

39. (Currently Amended) An apparatus ~~(6,8)~~ for recording a multiplex of elementary stream data received in a transport format the apparatus comprising means specifically adapted to generate and record a modified transport stream by a method as claimed in claim 28.

40. (Currently Amended) A method comprising:
identifying and selecting transport packets which correspond to the wanted content of a wanted program from a multiplexed transport stream comprising multiple elementary streams conveying not only the wanted content of the wanted program ~~(wanted content)~~ but also the unwanted content of other programs that are not wanted ~~(the unwanted content)~~, the elementary streams of data having been encoded and divided into elementary stream ~~(ES)~~ packets with packet headers, the ES packets being further sub-divided into a plurality of smaller transport packets, and the transport packets

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of a first and second elementary streams being interleaved in the multiplexed transport stream with each other and with transport packets carrying data from neither the first or second stream;

forming a modified transport stream containing the selected packets so as to preserve compliance with a transport stream target decoder model substantially without repacketizing or remultiplexing the streams;

generating auxiliary information for use by a reproducing apparatus in gaining access to the content of the modified transport stream via any of a set of potential entry points throughout the wanted content; and

transmitting the modified transport stream together with the auxiliary information into a medium.

41. (Previously Presented) The method of claim 40 wherein the medium includes one or more of a record carrier, and a cable, and a satellite.